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ABSTRACT

This paper reviews the assessment and diagnosis of attention deficit/hyperactivity disorder (ADHD) in adults. To provide baseline information, consideration is given to outcome studies for adults who were first diagnosed with ADHD as children. Studies of clinical assessment methods are addressed, and previous diagnostic criteria are compared to current criteria. Also considered is the area of retrospective childhood diagnosis. The retrospective approach of reviewing childhood symptoms was found to provide moderate agreement between parental and subject recollections of childhood behavior; however, there may be a tendency for subjects to under-report their symptoms compared to parents. Presence of co-morbid disorders such as learning disabilities has confounded much of the clinical assessment of symptomotology. Tests which have been used to differentiate children with ADHD and those with learning disabilities are examined, as are the use of neuropsychological tests in adults. It is concluded that the lack of consensus in the existing literature suggests that a multimodal method of assessment appears necessary at this time. (Contains 39 references.) (SW)

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ED 386 006

A REVIEW OF DIAGNOSTIC METHODS FOR IDENTIFYING ATTENTION-DEFICIT/HYPERACTIVITY DISORDER IN ADULTS

A Doctoral Research Paper

Presented to

the Faculty of the Rosemead School of Psychology

Biola University

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Psychology

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by

Richard C. Beuttler

May, 1995

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ABSTRACT

A REVIEW OF DIAGNOSTIC METHODS FOR IDENTIFYING
ATTENTION-DEFICIT/HYPERACTIVITY
DISORDER IN ADULTS

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Richard C. Beuttler

Methods for diagnosing Attention-Deficit/Hyperactivity Disorder (ADHD) in adults were reviewed. This review incorporated outcome studies evaluating diagnostic criteria for ADHD adults who were first diagnosed as children, studies of retrospective diagnosis, and studies of clinical assessment methods. Retrospective assessment of childhood symptoms revealed moderate agreement between parental and subject recollections of childhood behavior. There may be a tendency for subjects to under report their symptoms when compared to parents (Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1993). The presence of co-morbid disorders such as learning disabilities has confounded much of the clinical assessment of symptomotology. Only the Continuous Performance Test (CPT) and the Controlled Oral Word Association Test (COWAT) differentiated child ADHD subjects from learning disabled subjects and controls (Barkley & Grodzinsky, 1994). However, even these tests had high rates of false negatives. Some neuropsychological tests in adults revealed significant differences in group means between ADHD subjects and controls, but the positive predictive power and the negative predictive power has not been investigated. The lack of concensus in the existing literature suggests that a multimodal method of assessment appears necessary at this point in time.

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A REVIEW OF DIAGNOSTIC METHODS FOR IDENTIFYING ATTENTION-DEFICIT/HYPERACTIVITY DISORDER IN ADULTS

Introduction

There has been increasing interest in the persistence of ADHD into adulthood. Recent research has shown that about 60% of those diagnosed with ADHD as children continue to have problems with impulsive decision making and impulsive lifestyles as adults (Swanson, 1993). Following much attention directed to this diagnostic category in the popular press, many adults are self-referred and seeking treatment from psychiatrists for ADHD (Shaffer, 1994). In addition, other adults are coming to the attention of clinicians as a result of their children being referred and diagnosed with ADHD.

As clinicians, it is important to pull together the available research on diagnostic methodology for ADHD and provide consistent information to consume This process should begin with the ability to diagnose accurately. An accurate diagnosis is necessary prior to deciding on treatment options. Unfortunately, the diagnosis of ADHD in adults is not, at present, a clear cut process.

ADHD is a disorder that, by definition, begins in childhood, yet many adults who present for evaluation for ADHD were never assessed as children (Ratey, Greenberg, Bemporad, & Lindem, 1992). Diagnostic criteria in the Diagnostic and Statistical Manual of Mental Disorders (4th ed., DSM-IV, American Psychiatric Association [APA], 1994) requires that the condition be

present before the age of seven. To make the diagnosis in adults, the client's current symptoms as well as historical childhood symptoms need to be assessed.

Initially, this paper will examine the status of adults who were first diagnosed as children. This information can provide baseline information for comparison of adults with ADHD symptoms, who were not assessed as children. Next, current diagnostic criteria will be investigated and compared to previous criteria. Methods of arriving at a retrospective childhood diagnosis will also be discussed. Finally, clinical methods of assessing current symptoms will be reviewed. By investigating each of these areas, this paper will attempt to review and assimilate the available research on ADHD for the purpose of facilitating the assessment and diagnosis of ADHD in adults.

Adult Adjustment of Children Previously Diagnosed as Hyperactive

Several studies have assessed adult adjustment of children who were diagnosed with ADHD. The purpose of these studies was to determine if the impairment found in ADHD children persisted into adult life, to what extent, and which aspects of their lives were affected. One problem that these studies share is that the inclusion criteria that were originally used to diagnose the subjects as children were out of date at the time the studies were implemented. An additional drawback is that these studies have not controlled for the presence of learning disabilities which has been shown to be frequently comorbid with this population (Barkley, DuPaul, & McMurray, 1990). Only one study did report the presence of reading disabilities, but did not control for this phenomenon and did not investigate the prevalence of other disorders (Mannuzza et al., 1993).

The first controlled study of adults diagnosed with hyperactivity as children was conducted by Borland and Heckman (1976). These researchers studied men who had been treated at a clinic 20-25 years previously. None of the subjects was originally diagnosed as hyperactive or as having minimal brain dysfunction (MBD), but retrospective diagnoses were made on the basis of their records. Non-hyperactive brothers of these subjects were used as controls, because they were thought to represent the same demographics and backgrounds as the identified subjects. To be included in this study, the records of the subjects had to show both overactivity and short attention span as well as four or more of 35 other symptoms that were thought to reflect the hyperactive child syndrome. In addition, each subject had to have an IQ of at least 80, to have attended regular classes in school, and have no chronic medical or neurologic disease or other orthopedic or sensory handicap. Follow-up information was obtained from 20 of 37 men who met the criteria. The mean age at the time of their referral to the clinic was 7.45 years and at follow-up was 30.4 years. The mean age of their brothers was 28.1 years. From initial records, all of the subjects had at least 6 symptoms of hyperactivity, but on follow-up the mean number of symptoms declined to 3.0. However, the clinic records probably contain parent and clinician evaluations, whereas, the follow-up study used the subject's self-report.

As compared to their brothers, clinical subjects worked significantly more hours each week, had more previous jobs, changed jobs more often, and had a lower socioeconomic status (Borland and Heckman, 1976). The authors reported that the frequency of changing jobs was not due to an excess of sociopathy in the subject group. The most common reason for extra work was to receive extra

income; however, each of the subjects also reported extra work as a way to avoid feelings of restlessness and nervousness. Significantly more clinical subjects than brothers reported nervousness, restlessness, and difficulty controlling their temper. School grades were significantly lower in clinical subjects than their brothers during senior high. Also, none of the brothers and only four of the clinical subjects were diagnosed as sociopathic.

A major problem with the study was the retrospective diagnostic method using clinic records instead of using children who were diagnosed with the disorder at the time of the original assessment (Borland and Heckman, 1976). However, by using this method, useful information was obtained that would not have otherwise been available for years. Obviously the benefits outweigh the flaws, but the limitations need to be taken into account when making projections. The problem with using brothers as controls is that undiagnosed ADHD could be present. Also, these are controls who have lived in a family with at least one hyperactive member, and these families may not be representative. In addition, since studies have shown that ADHD tends to run in families, there is a chance that the subjects and their brothers were raised by an ADHD parent.

An important finding in the study was the long term difficulties of ADHD subjects in occupational and educational success (Borland and Heckman, 1976). At the time, the symptoms of ADHD were thought to disappear by adulthood. This evidence stood in stark contrast to that belief.

Weiss, Hectman, Perlman, Hopkins, and Wener (1979) and Weiss, Hectman, Milroy, and Perlman (1985) assessed the same group of subjects at 10 and 15 years follow up after being diagnosed with hyperactivity. 75 of a pool of 104 subjects were located at the 10 year interval and 63 were available at the 15

year follow-up. The mean age at 10 years was 19.5 and at 15 years the mean age was 25. Control subjects were obtained from the same high schools as the subjects. The controls were matched with respect to age, sex, and socioeconomic status, but there was a higher mean IQ for controls; 108 compared to 105 for subjects. The purpose of the study was to examine the natural outcome in adult life of hyperactive children not receiving treatment. All of the subjects received at least 10-25 sessions of individual or family psychotherapy and 10 received more than 25 sessions. None of the subjects received methylphenidate, but 40 subjects had received some form of medication therapy for 6 to 48 months. The medications given most frequently were chlorpromazine and dextroamphetamine. The researchers considered this amount of intervention to reflect a "relatively untreated" (Weiss et al., 1979, p. 676) population. The original criteria for inclusion in the subject group were;

> 1. Restlessness and poor concentration were their main complaints and had been present since the earliest years.
> 2. The complaints were a major source of problems at home and at school.
> 3. All children had WISC IQs (Full Scale) above 85.
> 4. None of the children were psychotic or borderline psychotic, epileptic, or had cerebral palsy.
> 5. All of the children were living at home with at least one parent. (Weiss et al., 1979, p. 676)

At the 10 year follow-up significantly less of the subjects were living with their parents than controls (Weiss et al., 1979). The subjects made significantly more moves and had a higher number of car accidents. The subjects completed significantly fewer years of education and received significantly lower grades in high school. The drop out and expulsion rates were significantly higher for the subjects than for the controls. Also, significantly more subjects were still trying to complete high school at the time of the follow-up. There was no significant

difference found in job status. Significantly more hyperactives had used non-medical drugs in the past five years, but their was no significant difference in non-medical drug use in the past year. One interesting and unexplained finding was that significantly more controls were found to have used hallucinogens in the past year. Differences in alcohol use or abuse was not mentioned. During psychiatric assessment, significantly more hyperactives felt restless and were observed to be restless during the interview. Personality trait disorders were diagnosed significantly more in the hyperactive group, the most common being "'impulsive' and 'immature-dependent'" (Weiss et al., 1979, p. 680). On the Brief Psychiatric Rating Scale, anxiety, tension, grandiosity, and hostility were significantly higher in the hyperactive group. This group also reported an unhappy childhood significantly more often than controls.

The DSM-III (APA, 1980) had not been available either for the initial assessment nor for the 10 year follow-up. In the 15 year follow-up, the researchers reported that it was their impression that all of the subjects met criteria for Attention Deficit Disorder (ADD) with Hyperactivity and a majority had associated Conduct Disorder (Weiss et al., 1985). Hyperactive subjects completed significantly less years of education and had significantly more children. Significantly more hyperactive subjects (66%) complained of at least one symptom than did controls (7%). Significantly more also reported feeling and were observed to be restless during interviews. There were no differences found with respect to alcohol abuse. Significantly more hyperactive subjects reported neurotic and interpersonal problems and there were significantly more suicide attempts in the hyperactive group. The hyperactive subjects had a significantly lower Global Assessment Scale than controls using DSM-III (APA,

1980). Also, significantly more hyperactive subjects met criteria of Antisocial Personality Disorder, 23% vs. 2.4 %, but only after the requirement of "having no one you felt close to" (Weiss et al., 1985, p. 216) was dropped. Researchers also reported that 5 of the 14 hyperactive subjects might not be judged by others to be antisocial because of the milder nature of their antisocial acts. An additional finding was that hyperactive subjects had significantly higher ratings of psychopathology and endorsed more symptoms on self-rating scales.

These studies did not assess nor control for the presence of learning disabilities. It is reasonable to question the degree that learning disabilities might have affected job status and school performance. Only around 60 % of the target group was assessed at 15 years.

In a later comparison using the same subject pool (Greenfield, Hechtman & Weiss, 1988), the differences in subjects reporting moderate to severe disability resulting from ADHD symptoms and those reporting mild or no current problems resulting from ADHD symptoms were compared. The subgroup reporting moderate to severe symptoms exhibited significantly more antisocial behavior (64% vs. 18%) and alcohol abuse (68% vs. 33%).

In a more recent study Mannuzza et al. (1993) evaluated educational achievement, occupational rank, and psychiatric status of boys who had been previously diagnosed as hyperactive The mean age at initial assessment was 9.3 years and the mean age was 26 years at follow-up. Controls were matched with respect to age and social class. The entry criteria for the hyperactive group were:

1. Referral by teachers because of behavior problems,
2. elevated scale ratings of hyperactivity by teachers and by parents or clinic staff,
3. a diagnosis of DSM II hyperkinetic reaction of childhood,
4. an IQ of at least 85 on the Wechsler Intelligence Rating Scale for Children,

5. absence of psychosis and neurological disorder, and
6. English-speaking parents and a home telephone.
(Mannuzza et al., 1993, p. 566)

The researchers tested for learning disabilities in the subject group but found only 8 of the 99 subjects with a 1.5 standard deviation difference between intelligence and reading standard scores and only 1 subject with a 2 standard deviation difference. They concluded that reading disorder was relatively rare in their sample, and therefore, did not control for it. The presence of other learning disorders were not investigated. These are more stringent criteria than has been used in other research (Barkley et al., 1990).

At follow-up, 88% of the original group assessed was evaluated (Mannuzza et al., 1993). Subjects had significantly lower social class rankings than controls, completed significantly less schooling, and significantly more dropped out of school. Subjects had significantly lower occupational rankings, and significantly fewer held professional jobs. A significantly higher percentage of the subjects was diagnosed with Antisocial Personality Disorder (18% vs. 2%) and nonalcoholic substance use disorders (16% vs. 4%). There was no significant difference in alcohol use disorders. The number diagnosed with ADHD was relatively small: 8% of subjects vs. 1% in controls. Three percent in the subject group reported some symptoms of ADHD, but did not meet the full criteria. When the researchers controlled for Antisocial Personality Disorder, subjects still showed deficits in education and occupational status. The prevalence of a substance use disorder in the subject group diagnosed as antisocial was 40%. In subjects not diagnosed as antisocial, the prevalence was 13%. Also, 13% of controls were diagnosed with substance use disorders. Thus, the presence of

Antisocial Personality Disorder accounted for the difference in the substance abuse disorders.

The most interesting finding was the low rate of ADHD found in the subjects ((Mannuzza et al., 1993). The researchers cite that one possible explanation of the differences was that different sources were used to obtain the second diagnosis. Initial diagnoses were obtained from parent and teacher reports and the follow-up diagnoses were obtained by self reports. Mannuzza et al. (1993) compared the symptoms obtained at adolescence from parent reports to adult self-reports of symptoms. Parents endorsed 36% of the symptoms of attention difficulties, and subjects only endorsed 19%. Also, symptoms of impulsivity and hyperactivity were reported with increased prevalence by the parents: 41% vs. 16% and 32% vs. 21%, respectively. Thus, the researchers concluded that these numbers likely underestimate the percentage of ADHD, and that ADHD adults may under-report their symptoms.

Criteria for ADHD

Diagnostic criteria for ADHD have evolved over the past several decades. These criterion evolved out of an initial concept of MBD, later called ADD and finally ADHD. In the following section, the criteria from the recent editions of the DSM (APA, 1980, 1987, 1994) as well as the Wender-Utah Criteria will be reviewed (Wender et al., 1985). These criteria have been the major versions relied upon by recent research.

DSM III

The DSM-III (APA, 1980) divided ADHD into two sub-types. ADD with Hyperactivity and ADD without Hyperactivity. As the name specifies, the

diagnosis of ADD with Hyperactivity required the symptom of hyperactivity to be present. ADD without Hyperactivity included the same cluster of symptoms without the requirement of hyperactivity. Also, a separate code was included for ADD, Residual Type. This category was used for adults with the disorder, but it required that signs of hyperactivity were no longer present. It was assumed that the symptom of hyperactivity disappeared with age, frequently during the course of adolescence.

The criteria for ADD with Hyperactivity were:

A. Inattention. At least three of the following:
(1) often fails to finish things he or she starts
(2) often doesn't seem to listen
(3) easily distracted
(4) has difficulty concentrating on schoolwork or other tasks requiring sustained attention
(5) has difficulty sticking to a play activity

B. Impulsivity. At least three of the following:
(1) often acts before thinking
(2) shifts excessively from one activity to another
(3) has difficulty organizing work (this not being due to cognitive impairment)
(4) needs a lot of supervision
(5) frequently calls out in class
(6) has difficulty awaiting turn in games or group situations

C. Hyperactivity. At least two of the following:
(1) runs about or climbs on things excessively
(2) has difficulty sitting still or fidgets excessively
(3) has difficulty staying seated
(4) moves about excessively during sleep
(5) is always "on the go" or acts as if "driven by a motor"
(APA, 1980, p. 43-44)

Also required were an onset before age seven, at least six months duration, and not due to Schizophrenia, Affective Disorder, or Mental

Retardation. The criteria for ADD without Hyperactivity are the same except that the individual does not meet the criteria for hyperactivity, criteria C.

The DSM-III (APA, 1980) developed criteria for adults who had the disorder as a child and continue to experience symptoms as adults. The criteria for ADD, Residual Type were as follows:

> A. The individual once met the criteria for Attention Deficit Disorder with Hyperactivity. This information may come from the individual or from others such as family members.
>
> B. Signs of hyperactivity are no longer present, but other signs of the illness have persisted to the present without periods of remission, as evidenced by signs of both attentional deficits and impulsivity (e.g. difficulty organizing work and completing tasks, difficulty concentrating, being easily distracted, making sudden decisions without thought of the consequences).
>
> C. The symptoms of inattention and impulsivity result in some impairment in social or occupational functioning.
>
> D. Not due to Schizophrenia, Affective Disorder, Severe, or Profound Mental Retardation, or Schizotypal or Borderline Personality Disorders. (APA, 1980, p. 44-45)

DSM-III-R

In the DSM-III-R (APA, 1987), the requirement of the specific requirements of "hyperactivity", "inattention", and "impulsivity" were dropped. Instead, the symptoms of these different features were combined into the category ADHD. ADHD corresponds closely to ADD with Hyperactivity. The authors considered it unlikely that the subtypes used in DSM-III (APA, 1980) represented subtypes of a single disorder. They put ADD without Hyperactivity under Undifferentiated ADD and they concluded that further research was needed to indicate whether it represented a valid diagnostic category. Another change eliminated the category of ADD, Residual Type. They concluded from existing

research that hyperactivity sometimes continued into adulthood and the criteria were identical for adults as for children. Adults receiving this diagnosis were labeled as ADHD (residual state). Since it was felt that the disorder was more continuous than previously suspected, a separate diagnostic code was not given.

The DSM-III-R (APA, 1987) criteria require eight of the following symptoms:

> (1) often fidgets with hands or feet or squirms in seat (in adolescents, may be limited to subjective feelings of restlessness)
> (2) has difficulty remaining seated when required to do so
> (3) is easily distracted by extraneous stimuli
> (4) has difficulty awaiting turn in games or group situations
> (5) often blurts out answers to questions before they have been completed
> (6) Has difficulty following through on instructions from others (not due to oppositional behavior or failure of comprehension), e.g., fails to finish chores
> (7) has difficulty sustaining attention in tasks or play activities
> (8) often shifts from one uncompleted activity to another
> (9) has difficulty playing quietly
> (10) often talks excessively
> (11) often interrupts or intrudes on others, e.g., butts into other children's games
> (12) often does not seem to listen to what is being said to him or her
> (13) often loses things necessary for tasks or activities at school or at home (e.g., toys, pencils, books, assignments)
> (14) often engages in physically dangerous activities without considering possible consequences (not for the purpose of thrill seeking), e.g., runs into the street without looking.
> (p. 52-53)

The requirements also specify onset prior to age seven and excludes a diagnosis of Pervasive Developmental Disorder.

DSM-IV

The DSM-IV (APA, 1994) divides ADHD into three subtypes: Combined Type, Inattentive Type, and Hyperactive-Impulsive Type. For each subtype 6 or more symptoms are required for at least 6 months to a degree that is maladaptive and inconsistent with developmental level. The symptoms of Inattentive Type are:

> (1) often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities
> (2) often has difficulties sustaining attention in tasks or play activities
> (3) often does not seem to listen when spoken to directly
> (4) Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions
> (5) often has difficulty organizing tasks and activities
> (6) often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books, or tools)
> (7) is often easily distracted by extraneous stimuli
> (8) is often forgetful in daily activities. (APA, 1994, p. 83-84)

The symptoms of Hyperactive/Impulsive Type are:

> Hyperactivity
> (1) often fidgets with hands or feet or squirms in seat
> (2) often leaves seat in classroom or in other situations in which remaining seated is expected
> (3) often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
> (4) often has difficulty playing or engaging in leisure activities quietly
> (5) is often "on the go" or often acts as if "driven by a motor"
> (6) often talks excessively
>
> Impulsivity
> (7) often blurts out answers before questions have been completed
> (8) often has difficulty awaiting turn

(9) often interrupts or intrudes on others (e.g., butts into conversations or games). (APA, 1994, p. 84)

The individual symptoms are very similar to previous versions, but the groupings are somewhat different. The main difference between DSM-IV and its predecessors is that one can receive the diagnosis for having symptoms of inattention without hyperactivity or impulsivity. Another important feature is the requirement that the disorder be maladaptive and inconsistent with developmental level. It is not enough that the symptoms cause distress, the symptoms also need to impede performance in major areas of function.

Wender - Utah Criteria

According to Wender, Reimherr, Wood, and Ward (1985), the Utah criteria were developed as an aid in retrospective assessment of ADD, Residual Type. The criteria were revised in 1985 and in the author's view are more stringent than the DSM-III (APA, 1980). These revised criteria include a history of ADD with Hyperactivity in childhood and both an attentional deficit and hyperactivity persisting into adulthood. Also, they must have had two of the following: "1) affective lability, 2) inability to complete tasks, 3) hot or explosive temper, 4) impulsivity, and 5) stress intolerance" (Wender et al., 1985, p. 548).

The Utah criteria differ from the DSM criteria in an important way. The Utah criteria include symptoms of affective lability and hot or explosive temper. These are symptoms of an inability to modulate affect that are not included in the DSM criteria. Also, stress intolerance is not included in the DSM criteria. The DSM criteria seem to be more narrowly focused on difficulties in sustaining focus on tasks, difficulties holding back impulses, and overactivity..

Although each of these diagnostic conceptualizations have helped to define the syndrome, there are several problems with this type of criteria. These

criteria rely heavily on the ability of the reporters to observe and describe behavior accurately. The reliability of the reporters must be assumed. Also, symptoms are expressed as behaviors that occur in the target group more frequently than in the normal population. A subjective judgment needs to be made for each symptom on whether or not it is present. Many of the symptoms specify that a behavior must occur "often". This makes diagnosis more difficult than conditions that have specific symptoms. For example, learning disorders require marked differences between scores on intelligence and achievement tests. The symptoms of Conduct Disorder are also more specific, for example, "has used a weapon that can cause serious physical harm to others, has stolen while confronting a victim" (APA, 1994, p. 90). These symptoms do not require subjective judgments as ADHD does. Because of these difficulties there could be a problem of false positives, and the diagnosis is more difficult to rule out. False positives can occur when someone is searching for explanations on why things in their life are going wrong. The diagnosis is also difficult to rule out since many people have the symptoms to some degree. Sometimes from often is a difficult distinction to make.

Requirements for Diagnosis

A couple of requirements are important in the DSM-IV (APA, 1994) in addition to the listed symptoms. First, there needs to be clear and significant impairment in school, academic, or occupational functioning. There are no specifications made about what constitutes clear and significant impairment; however, this is a more stringent requirement than either impairment or distress. A client's feelings of distress do not constitute an impairment in functioning.

Another important requirement is that the symptoms do not exclusively occur during the course of Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder. These disorders may produce the symptoms and need to be ruled out before making the diagnosis. Also, the symptoms cannot be better accounted for by another mental disorder. Obviously, many mental disorders can produce functional impairment. Other mental disorders can also account for poor scores on measures of attention and neuropsychological measures. ADHD has been shown to have a high rate of co-morbidity with learning disabilities, and learning disabilities have been shown to produce depressed scores on some measures of attention and neuropsychological measures (Barkley & Grodzinsky, 1994).

Furthermore, research has not used clinical controls with these measures. Therefore, it is not known if ADHD subjects perform more poorly than clients with mood disorders or other conditions. Also, there has been some evidence to suggest that substance abuse can affect performance of attention on neuropsychological measures (Fein, Bachman, Fisher, & Davenport, 1990; Grant et al., 1978; Grant Mohns, Miller, & Reitan, 1976,). With the lack of such research, poor results on a measure of attention do not indicate any particular diagnosis. Other possibilities that could explain functional impairment and poor results on attention or neuropsychological measures need to be investigated and ruled out. Therefore, thorough clinical assessment is needed to investigate the existence of other disorders.

Parent Checklists as a Method for Making a Retrospective Childhood Diagnosis

Tarter, McBride, Buonpane, and Schneider (1977) investigated the childhood history of MBD to assess differences in alcoholics. To assess MBD, the

researchers gave the subjects a 50 item questionnaire that was to reflect MBD in children; however, many of these items would not be included in current conceptions of ADHD. Items such as "poor handwriting, difficulty in mathematics, difficulty learning to read, difficulty learning to write, delayed speech development poor speech, mirror vision (reading backwards), and left back in school" (Tarter et al., 1977, p. 765) may reflect current conceptions of learning disabilities. Items such as, "can't accept correction, lying, truancy, fights, unresponsive to discipline, stealing, vandalism, overly aggressive, and destructive" (Tarter et al., 1977, p. 765) may more closely reflect current criteria for Conduct Disorder or Oppositional Defiant Disorder than ADHD. Other symptoms in the scale do reflect current criteria of ADHD such as "impulsive, can't tolerate delay, can't sit still, short attention span, fidgets, doesn't complete projects, overactive, and talks to much or too loud" (Tarter et al., 1977, p. 765). Other items on the scale reflect various developmental problems. It appears that this scale may reflect more general developmental problems rather than a specific disorder according to current criteria. The results of the study indicated that primary alcoholics, those who had more symptoms of alcoholism at a younger age, endorsed more symptoms of MBD.

DeObaldia and Parsons (1984) investigated the Hyperkinesis/Minimal Brain Dysfunction Scale (Hk/MBD Childhood Symptoms Checklist) used by Tarter et al. (1977) discussed above. For test re-test reliability, the checklist was given to a sample of 45 alcoholics between the 2nd and 3rd week after entering a treatment program and again in the ninth week of treatment. The range of time was 44 to 49 days. The Pearson product-moment correlation coefficient was r=.93. The validity was evaluated by correlating subjects ratings of their own

childhood behavior to ratings of their parents or older siblings. The correlation to parents or older siblings was .47. When the parents ratings were correlated to subjects ratings without using sibling ratings the correlation was .62. The correlation of subject ratings to sibling ratings was .10. The parent to subject correlation was moderate. The authors use this correlation as a measure of validity. However, inter-rater agreement should not be considered an accurate measure of whether or not a scale assesses what it is designed to assess. The scale would need to be compared to alternative means of assessing MBD. Agreement of different raters reflects inter-rater reliability rather than validity. An important finding from this study was the low correlation of sibling ratings to subject ratings. In clinical assessment of ADHD, substituting sibling ratings when parent's ratings are not available, would not be routinely recommended based upon these results.

Wender, Reimherr, and Wood (1981) investigated retrospective diagnosis and drug treatment of adults with ADD. They used specific inclusion criteria for the ADD group:

> The subject has four of the following characteristics, one of which must be either 1 or 2: (1) motor hyperactivity persisting from childhood, (2) attention deficits persisting from childhood, (3) affective lability, (4) inability to complete tasks, (5) hot or explosive temper, (6) impaired interpersonal relationships or inability to sustain relationships over time, (7) impulsivity, or (8) stress intolerance. (Wender et al., 1981, p. 450)

Subjects were excluded if they had ever met DSM-III (APA, 1980) criteria for Schizophrenia, Schizoaffective Disorder, primary affective disorder, Schizotypal Personality, or Borderline Personality. In addition to meeting these criteria, the researchers had the parents of the subjects fill out a modification of the Conners

Abbreviated Rating Scale called the Parents Rating Scale. The scale is normed on teacher ratings of children.

Subjects with high scores on the Parents Rating Scale had a mean full scale IQ of 110 on the Wechsler Adult Intelligence Scale - Revised (WAIS-R), and Wide Range Achievement Test (WRAT) Spelling and Arithmetic means of 89 (Wender et al., 1981). Scores on the Reading subtest of the WRAT were not reported. This raises the suspicion of possible learning disabilities in this subject group. The usefulness of the criteria were judged according to the treatment effects found in the medication study. The study only showed positive treatment effects when subjects were divided into low and high scores on the Parents Rating Scale rather than the inclusion criteria. The authors concluded that the problems arose from their operational criteria for inclusion. They included people irrespective of scores on the Parents Rating Scales and they required only a childhood history of hyperactivity or inattention rather than meeting the full criteria for childhood ADD. They believed that their treatment group consisted of a heterogeneous group of psychiatrically disturbed patients along with those having ADD, Residual Type. The researchers felt that meeting the full DSM-III (APA, 1980) criteria of ADD in childhood rather than simply having a history of hyperactivity in childhood should be required for diagnosis.

Later, The Wender Utah Rating Scale was developed as one method of retrospective diagnosis of childhood ADHD (Ward, Wender, & Reimherr, 1993). The scale has 61 items that are rated on a 5 point likert scale. The adults rated how their behavior was when they were a child. Of the sixty one items, the 25 items with the greatest mean differences between the groups were used to compute a score.

The advantages of this scale is that it is quick and easy for clients to fill out and it does not require a parent contact or involvement in treatment (Ward, Wender, & Reimherr, 1993). Also, even when a parent is available to give a childhood history, the time it takes to contact a parent makes this a more desirable method in some cases. The split half reliability correlations were .90. Correlations with the Parents Rating Scale were .49 for the normal group and .41 with the ADHD group. With the cutoff score was set at 36, the scale placed 96 % of the normal group correctly and 96% of the ADHD group correctly. When a clinical group of depressed subjects was included, the cutoff score needed to be raised to 46. With this cutoff score, 99% of the normal group was categorized correctly along with 86% of the ADHD group and 81% of the depressed group. Having 19% false positives in the depressed group appears high.

The scale has a few shortcomings that need further research in order to increase the strength of the scale. First, statistical analysis could be used to better select which and how many of the 61 items best discriminate the populations. The mean ages of the sample groups were significantly different. The effect of these differences on the results is unknown. One disturbing result was the moderate correlation (.41) with the Parents Rating Scale.

A major shortcoming of the scale was that the researchers did not attempt discriminate validity studies with childhood problems that may have had more similar histories than depression, such as Conduct Disorder or learning disabilities. Disorders that may have more similar childhood profiles such as learning disabilities or Conduct Disorder may be more difficult to differentiate from ADHD subjects.

Biederman, Faraone, Knee, and Munir (1990) also used a retrospective method to assess ADD according to DSM-III (APA, 1980) criteria in non-referred individuals. They assessed the parents and siblings of ADD children. The diagnosis of parents was based on direct interviews using the Diagnostic Interview Schedule to cover adult disorders and the Diagnostic Interview for Children and Adolescents - Parent Version (DICA-P) to cover childhood disorders. ADD children and siblings were diagnosed by using interviews with their mothers according to DICA-P. Parents and siblings rated as ADD were compared to parents and siblings rated as non-ADD and to controls.

ADD relatives had significantly higher numbers of Antisocial Personality Disorder, Conduct Disorder, or Oppositional Defiant Disorder than controls and non-ADD relatives (Biederman et al., 1990). The ADD relatives also had significantly higher incidence of Antisocial Personality Disorder or Conduct Disorder than normals. ADD relatives also had a higher incidence of Oppositional Defiant Disorder and enuresis than controls or non-ADD relatives. Non-ADD relatives had a significantly higher incidence of drug dependence than controls and a significantly higher incidence of Major Depressive Disorder than controls and ADD relatives.

The researchers reported that the higher incidence of antisocial problems (Antisocial Personality Disorder, Conduct Disorder, and Oppositional Defiant Disorder) is indirect evidence supporting the validity of the retrospective method of diagnosis of ADD, since ADD and these problems are frequently co-morbid (Biederman et al., 1990). However, the researchers included both adults and children in the same groups. The collapsing of Conduct Disorder with Antisocial Personality Disorder makes the results suspect. Not every person diagnosed

with Conduct Disorder goes on to have Antisocial Personality Disorder. However, everyone with Antisocial Personality Disorder had Conduct Disorder as a child. Antisocial Personality Disorder represents a severe form of Conduct Disorder that becomes pervasive into adult life. These are not equivalent disorders. Since many more people have Conduct Disorder than go onto have Antisocial Personality Disorder, putting these two diagnoses together confounded the results. Also, these results cannot be used to support the validity of retrospective assessment, since the results included children. Siblings and parents were included in the same groups. In addition, the differences in the numbers of Antisocial or Conduct disorder was not significantly different between ADD and non-ADD adults. It was only significant when Oppositional Defiant Disorder was included with Antisocial Personality Disorder or Conduct Disorder. Also, the number of children in that group would be over represented since the criteria for children meeting Oppositional Defiant Disorder or Conduct Disorder is more inclusive than the diagnosis of Antisocial Personality Disorder in adulthood and would therefore be skewed to included greater proportions of children than adults.

In all of the above studies of assessment, the criteria used are largely based on subjective judgments done retrospectively. Studies have shown only moderate correlation between adults' memory and parents' memory of subjects' childhood behavior, (.41, .62) (DeObaldia & Parsons, 1984; Ward et al., 1993,). To better investigate the accuracy of retrospective diagnosis, scores from adults who were originally diagnosed as children could be compared to scores obtianed by self-report retrospectively. By doing this, the ability of these measures to differentiate ADHD from other childhood disorders could be investigated.

Differentiating Conduct Disorder, learning disabilities, and other problems from ADHD is a difficult task with child clients. It would seem to be immensely more difficult to do this retrospectively. These measures need to be further evaluated as to how well they can actually discriminate. It may be the case that retrospective measures perform well at picking up childhood pathology, but do not do as well at differentiating specific pathologies.

Clinical Assessment of Symptoms

To overcome the problems faced with using subjective self-report data, a clinical test or measure would greatly increase the practitioners ability to make a diagnosis. The tests most widely used to detect the symptoms of ADHD have been neuropsychological measures of attention and frontal lobe functions. The similarity between the outward symptoms of ADHD and frontal lobe brain damage has led researchers to utilize frontal lobe tests in an attempt to discover differences in the performance on these tests between ADHD subjects and controls.

Clinical assessment has centered predominately on children, and only recently has this type of assessment been used with adults. Because of this phenomenon, this paper will review the use of neurological assessment in diagnosing ADHD in children as well as in adults. It is hoped that the tests and methods that have proven useful in children will also be useful in diagnosing ADHD in adults.

Theory of Frontal Lobe Deficits. There have been several theories of etiology for ADHD; however, much of the recent literature has focused on a theory of frontal lobe dysfunction (Zametkin & Rapoport, 1987). The crux of the theory of frontal lobe dysfunction rests on comparisons of the deficits of ADHD

persons and persons with frontal lobe damage. Benson (1990) believed that the ability to maintain sequences, control dives, and self-monitor along with having a high IQ without the ability to use it effectively are the hallmarks of ADHD. He stated that these problems are similar to those observed in individuals with frontal lobe damage. He also deduced that since some individuals outgrow ADHD, this could reflect a delay in brain maturation or delay in mylination. The frontal lobe is thought to be the last place to mylinate, and also males tend to mylinate later than females. This theory makes intuitive sense, because a delay in mylination could then produce frontal lobe symptoms and this theory seems to explain the over representation of males with the diagnosis of ADHD. However, at this point, delays in mylination have not been confirmed in those diagnosed with ADHD.

Denckla (1991) also made the argument based on the face validity of the similarity of the problems of persons with ADHD and persons with frontal lobe deficits. She reported that the dorsolateral prefrontal lobe is the area of the brain controlling executive function. This area controls the capacity to attend to more than one component of a situation at once, while resisting outside interference of distractions. It controls inhibiting off task or inappropriate responses, as well as planning, sequencing, and maintaining appropriate response output for significant periods of time. She noted that this area of the brain is also late in the development of mylination.

Unfortunately, there are not a lot of studies verifying actual differences in the brains of ADHD subjects and controls. Zametkin et al. (1990) attempted to find differences in cerebral glucose metabolism between adults diagnosed with ADHD and controls. The criteria for inclusion in the ADHD group was a self

report of childhood symptoms that met the criteria of ADD with Hyperactivity in DSM-III (APA, 1980). Also, adult symptoms had to meet the Utah criteria for ADD in adulthood. In addition, the subjects had to be the biological parents of children who were diagnosed with ADD with Hyperactivity and there had to be an absence of a history of any other major psychiatric disorder, including alcohol, substance abuse, or conduct disorders. One problem with these criteria may be the reliance on the subjects' self-report of their childhood behavior. This problem is not alleviated by requiring that the subjects be biological parents of children diagnosed with ADD with Hyperactivity, since this diagnosis is heavily dependent on parental report. Because the criteria for the ADHD subjects is heavily dependent on the subjects own reports, this group may contain individuals whose actual behavior may not be significantly different from controls.

Four regions primarily in the premotor and somatosensory cortex had significantly lower metabolism in the patients than in the controls (Zametkin et al., 1990). In all, 30 of the 60 brain regions studied had depressed metabolism. The greatest differences included, but were not limited to, the premotor and the superior prefrontal areas. Although these research findings are intriguing, this method has not been used to aid in making a diagnosis.

Clinical Assessment in Children. Since ADHD has often been considered a childhood disorder, the major focus of clinical assessment has been on children rather than adults. Because of this, there are more controlled studies involving children with carefully selected groups. Also, some researchers are doing longitudinal studies and have followed clinically diagnosed children into adolescence.

An early study by Reitan and Boll (1973) gave an extensive neuropsychological assessment to ADHD subjects, brain damaged subjects, and controls. An earlier theory of ADHD was that the symptoms were caused by diffuse mild brain dysfunction or damage. The name at the time for ADHD was MBD. The question researchers sought to answer was to what extent did children with MBD show deficits similar to those with brain damage when compared to controls. The criteria used for the MBD group was a full scale IQ of 80 or above, and positive indications of learning or behavioral disabilities associated with impairment of perception, conceptualization, language, memory, or control of attention, impulse, or motor function. This group was then broken down into subgroups of whether the referral was primarily for academic reasons or because of behavioral problems. The main instruments used were the Wechsler Intelligence Scale for Children (WISC), the WRAT, and the Reitan-Indiana Neuropsychological Test Battery.

One problem in the study was the loosely defined criteria for inclusion. The criteria used for minimal brain dysfunction might include subjects with primary learning disabilities, ADHD, Conduct Disorder, Oppositional Defiant Disorder, and possibly other diagnostic conditions (Reitan and Boll, 1973). However, it may not be fair to base current diagnostic divisions on this research. This research is useful, because the cognitive deficits were not seen in only certain areas, but rather in many different areas. The academic referred MBD group might consist of a large proportion of learning disabled subjects, whereas the MBD behavior problem group might consist of a combination of ADHD and conduct disordered subjects. Because of the high representation of learning

disabilities within the ADHD groups (Barkley et al., 1990), tests which help differentiate these groups would be extremely useful.

Overall, the controls tended to perform the best, followed by the behavior problem MBD group, then the academic problem MBD group, and the group with confirmed brain damage tended to do consistently the worst of all the groups (Reitan and Boll, 1973). The group means were found to be significantly different on the WISC subtests Information, Similarities, and Arithmetic. There were also, significant differences on the WRAT Reading subtest and the Tactual Performance Test - Memory subtest.

Fischer, Barkley, Edelbrock, and Smallish (1990) investigated the status of adolescent subjects on academic, attention, and neuropsychological tests who had been previously diagnosed as hyperactive. To be included in the hyperactive group, subjects had to be two standard deviations above the mean on both the Hyperactivity Index of the Revised Conners Parent Rating Scale and the Werry-Weiss-Peters Activity Rating Scale and have scores exceeding the 93rd percentile or 1.5 standard deviations on the Home Situations Questionnaire. These subjects also had to have parent or teacher complaints (as reported by the parent) of poor sustained attention, poor impulse control, and excessive activity level. These symptoms must have been present prior to the age of 6 and have been of at least 12 months duration. Also, there was to be no indication of autism, psychosis, thought disorder, epilepsy, gross brain damage, or mental retardation. These criteria were very strict when compared to other studies. The requirement of two standard deviations above the mean on two different measures and 1.5 standard deviations on another excludes many subjects that would have been included in other studies. Also, as a product of using the

Conners Hyperactivity Index, many of the subjects may have symptoms of hyperactivity and aggression, or Oppositional Defiant Disorder (Ullmann, Sleator, & Sprague, 1985). The control group had to score within 1.5 standard deviations on the Hyperactivity Index of the Revised Conners Parent Rating Scale and the Werry-Weiss-Peters Activity Rating Scale, have no history of referral to mental health professional, no parent of teacher complaints of significant behavior problems, and no evidence of any other psychiatric disorder.

The subjects were given a Wide Range Achievement Test - Revised (WRAT-R), The Kagan Matching Familiar Figures Test-20 (MFFT-20), and a CPT that included vigilance and distractibility subtests (Fischer et al., 1990). Observations were also taken during the performance of math problems. Behaviors of the math problems were categorized as off-task, fidgeting, vocalizing, playing with objects, and out of seat. The inter-rater reliabilities for these categorizations was .87 for off-task category, .83 for fidgeting, .90 for vocalizing, .98 for playing with objects, and .99 for out of seat. The subjects were also given the Selective Reminding Test, the Wisconsin Card Sorting Test, and the COWAT. These tests were chosen because they were thought to assess frontal and prefrontal cortical function.

The hyperactive group had a significantly lower estimate of IQ as assessed by the Peabody Picture Vocabulary Test - Revised and they had lower scores on the all three WRAT-R subtests (Fischer et al., 1990). The control group performed significantly better on the MFFT-20 than the hyperactive group. The hyperactive group made significantly more errors of both omission and commission of the vigilance task of the CPT, but there were no significant differences on the distractibility task. The hyperactive group displayed a significantly higher

percentage of occurrence of the behavior problems recorded during the math problems. None of the neuropsychological measures differentiated the groups.

Even though included in the review by Barkley, Grodzinsky, and DuPaul (1992), this study was reviewed because of the use of behavioral observations used and because of the strict selection criteria. It would be expected that the strict selection criteria would increase the chances of obtaining significant findings on the neuropsychological measures. The lack of such findings argues against the widespread use of these instruments to make this diagnosis.

Barkley et al. (1990) used strict criteria in selecting groups with ADHD. They attempted to investigate differences in ADD with Hyperactivity (ADD+H) and ADD without hyperactivity (ADD-H). They compared these two groups to normal controls and to children with learning disabilities without ADD. The researchers used operational definitions for inclusion in each of the groups.

Subjects were included in the ADD+H group if they met the following criteria:

> (a) complaints of short attention span, impulsivity, and overactivity at school as reported by mothers; (b) a duration of these problems of 6 months; (c) an age of onset of these problems before 7 years; (d) a score greater than the 93rd percentile on both the Inattention and Overactivity scales of the Child Attention Profile ... and; (e) no history of treatment with stimulant drugs or, if such a history, have physician consent to be removed from medication for 48 hr before evaluation in this study. (Barkley et al., 1990, p. 776)

For inclusion in the ADD-H groups subjects had to meet all of the except that on the Child Attention Profile the subjects had to have a score greater than the 93 percentile on the Inattention scale but a score below the 84th percentile on the Overactivity scale. Subjects in the learning disabled (LD) group had been referred to a pediatric or psychiatric clinic for assessment of academic learning

problems or currently placed in a learning disabled program. Also, they had to have teacher complaints of delays in reading, spelling, math, handwriting, or language and no teacher complaints of inattention, overactivity, impulsivity. Furthermore, the LD group scored below the 84th percentile on both the Inattention and Overactivity scales of the Child Attention Profile. The authors used cutoffs on the scales of 1.5 standard deviations above the mean to be considered pathological. Scores within one standard deviation from the mean were considered normal.

The subjects were placed into groups based upon teachers reports of behavior (Barkley et al., 1990). Mothers were used to rate the child's behavior on the Child Behavior Checklist. The mothers were also interviewed and given self-report measures on depression, brief psychiatric symptoms, marital adjustment, and stress. The subjects were given the Wechsler Intelligence Scale for Children - Revised (WISC-R), the WRAT-R, a CPT, and the Kagan Matching Familiar Figures Test (MFFT). The subjects behavior was also observed during a math problems test and during CPT testing. Motion was also assessed with the use of wrist and hand actometers during the math problems, the CPT test, and during a mother-child task.

There were many significant findings in this study (Barkley et al., 1990). The control groups had significantly higher IQ scores than the other three groups. The two ADD groups had significantly higher IQ scores than the LD group, but did not differ from each other. DSM-III-R (APA, 1987) diagnoses were obtained through interviews with the subject's mothers. The percentage of those receiving the diagnosis of ADHD was significantly higher in the ADD+H than in the other three groups. The ADD-H group also received a significantly

higher percentage of ADHD diagnosis than the LD and control groups, but one third of that in the ADD+H group. The ADD+H group had significantly more diagnoses of Oppositional Defiant Disorder and Conduct Disorder than the other three groups. The ADD+H group also had significantly more symptoms of Separation Anxiety Disorder than the other groups. A significantly higher number of ADD-H subjects received a diagnosis of Oppositional Defiant Disorder than the LD or control groups, but the percentage was half that of the ADD+H group. All three clinical groups had significantly more symptoms of Overanxious Disorder than the controls. The ADD-H endorsed significantly more symptoms of Major Depressive Disorder than the other three groups, however, no member met the full criteria.

On the WISC-R, significant effects were found on two of the subtests (Barkley et al., 1990). The ADD+H and LD groups performed significantly worse on the Arithmetic subtest, but the scores of these two groups were not significantly different from each other. On the Coding subtest, the ADD-H performed significantly worse than the other three groups, which did not differ among themselves on this measure. All three clinical groups performed more poorly than the control group on all three scales of the WRAT-R, but did not differ among themselves. All three clinical groups were rated worse by their mothers on the Communication and Socialization scales of the Vineland Adaptive Behavior Scales.

To obtain the prevalence of learning disabilities in the groups, the researchers defined learning disorders to be 1.5 standard deviations below the mean on an achievement test and an IQ score of 1 standard deviation above the score obtained on the achievement test. "The percentage of children with reading

disorders in each group was 19% for ADD+H, 18.8% for ADD-H, 18.8% for LD, and 0% for the control group. For spelling disorders, the percentage was 23.8% for ADD+H, 22.9% for ADD-H, 31.3% for LD, and 0% for the control group. For math disorders, the rates were 26.6% for ADD+H, 20.8% for ADD-H , 31.3% for LD, and 2.9% for the control group" (Barkley et al., 1990, p. 783).

There were no significant differences between the groups on the number of correct responses on the CPT (Barkley et al., 1990). However, the ADD groups performed significantly worse than the LD and control groups on the number of omissions and commissions. The ADD+H and the ADD-H were not significantly different except for the number of commissions, where the ADD+H had twice the number of commission errors. The ADD-H had significantly more commission errors than the LD group but not the control. The ADD+H group displayed significantly more off task behavior during this task than the other three groups.

On the math, test both ADD groups displayed more off task behavior than the LD group (Barkley et al., 1990). The ADD-H group completed significantly fewer problems than the ADD+H and LD groups. Scores on the MFFT and the wrist and ankle actometers were not found to be significantly different among the groups.

In an attempt to find qualitative differences in the ADD subtypes, the researchers compared the scores on the entire Inattention scale of the Child Behavior Checklist - Teachers Rating Form (Barkley et al., 1990). The ADD+H had significantly more problems with acting too young for age, making odd noises, fidgeting, disturbing others, messy school work, and irresponsible conduct. The ADD-H children had significantly more problems with being

confused, daydreaming or getting lost in thought, and being apathetic or unmotivated.

One important question addressed in the study was whether ADD+H and ADD-H are different degrees of the same condition or if they represent two different but overlapping conditions (Barkley et al., 1990). It could be argued that ADD-H was a milder aspect of ADD+H; however, the data argued for these being distinct conditions. The ADD-H group performed more poorly on the Coding subtest of WISC-R and completed fewer problems on the math test developed by the researchers. The ADD+H group committed significantly more commission errors and displayed significantly more off-task behavior on the CPT than the ADD-H group. Also, the profiles of the Inattention Scale of the Child Behavior Checklist - Teachers Rating Form differentiated the groups as outlined above.

The study was reviewed in such detail, because of the meticulous attention the researchers paid in defining the groups and designing the study (Barkley et al., 1990). Also, the ADD groups were compared to an LD group and the incidence of LD was investigated within the ADD groups. However, the cutoff scores of only a one standard deviation difference between intelligence and achievement might be considered overly inclusive and overestimate the proportion of learning disabilities. Despite this problem, the study illustrates the importance of systematic investigation of learning disabilities when studying ADHD.

Barkley et al. (1992) reviewed 22 neuropsychological studies of frontal Lobe functions in children diagnosed with ADD with and without Hyperactivity. The authors reported that many of the studies may have confounded their

studies by including children with learning disabilities and conduct problems in their groups of ADD. Tests using only a CPT were omitted because of the large volume unless other measures of frontal lobe deficits were included. According to the authors, differences in ADD+H are often found on the CPT particularly in errors of commission.

The authors found that the "CPT, Stroop (interference), Hand Movements, and Go-No-Go tests appear to have some reliability in detecting differences between ADD+H and normal groups of children" (Barkley et al., 1992, p. 171). The Wisconsin Card Sorting Test and the Trail Making Test time score on the standard version were useful for children between the ages of 6-11 but evidently this usefulness disappeared with older children. A problem with these tests was that most of the studies failed to use clinical control groups. It cannot be assumed that these tests could reliably distinguish the ADHD subjects and other clinical populations. Barkley et al. (1992) reports that the CPT is able to make such distinctions.

Previous research has been inconsistent at finding differences in cognitive styles between ADD+H and ADD-H. These researchers assert based partly on their previous study (Barkley et al., 1990) mentioned above that ADD+H and ADD-H have different cognitive styles with ADD+H having more problems with sustained effort during tedious boring tasks and ADD-H having a more "slow cognitive tempo" (p. 787). To investigate differences they divided the subjects into four groups, ADD+H, ADD-H, LD, and control. The selection criteria used for each group were identical to Barkley et al. (1990).

The ADD+H group was rated as significantly more inattentive on the Child Attention Profile than the other three groups (Barkley et al., 1992). The

ADD-H was rated as significantly more inattentive than the LD and the control groups and the LD group was rated as significantly more inattentive than the control. 91.6 percent of the ADD+H and 16.7 percent of the ADD-H met criteria for ADHD as defined by DSM III - R (APA, 1987). None of the subjects in the LD or control groups met the criteria.

The two ADD groups had significantly more omission errors on the CPT than control (Barkley et al., 1992). Both ADD groups and the LD group had lower scores on the reading portion and the interference portion of the Stroop test. The authors pointed out that this evidence contradicts previous evidence that the Stroop test was useful in detecting behavioral dysinhibition. They concluded that factors such as scanning, rapid naming, and general reading dysfluency seen in LD's may also contribute to poor scores. Also, the only measure that distinguished ADD subjects from LD subjects was the omission errors on the CPT. They concluded that impairments found in ADD groups on other tests may be partly a function of the LD or Conduct Disorder found in ADD populations. Studies need to control for the presence of LD and Conduct Disorder as well as other co-morbid conditions. Failure to do this can result in misattributing deficits to ADD, when they are due to other co-morbid disorders (Barkley et al., 1992). The sample sizes used were small in the study and a lack of significant differences could be due to this factor.

The ultimate question that the above studies have sought to answer was whether tests of attention and frontal lobe deficits are useful in making a diagnosis of ADHD and distinguishing ADD+H from ADD-H. To address that question, Barkley and Grodzinsky (1994) measured the sensitivity, the positive predictive power , and the negative predictive power of neuropsychological

measures taken on a previous study (Barkley et al., 1990). A small cluster of poor scores on a test can lower a group mean making it significantly different from a control group, while many scores in the target group could be indistinguishable from controls. This would cause the test to be of little use clinically, even though group means were statistically different. Sensitivity refers to the probability of having an abnormal score given membership in the group of interest. Positive predictive power refers to the probability of having the condition of interest given the presence of an abnormal test score (Barkley & Grodzinsky, 1994). Negative predictive power refers to the probability of not having the condition given the absence of an abnormal score on the test.

Barkley and Grodzinsky (1994) obtained normative data from a sample in the same community as their subjects. It was felt that the sample would have the same demographics as their subjects. By using their own normative data they were able to set their own definition of abnormal and keep it consistent across tests. Different test manuals may have different standard deviation cutoff scores from each other. The researchers chose scores greater than 1.5 standard deviations above or below the mean depending of the direction of abnormality on the test to be considered abnormal.

The CPT had modest sensitivity for ADD+H and for ADD-H, and it was not highly sensitive to LD or the controls (Barkley & Grodzinsky, 1994). The problem was that the positive predictive power was low when the ADD subtypes were considered separately When the ADD subtypes were combined, the positive predictive power increased to 100% for the commission score, and 92% for the correct response and omission scores. However, the negative predictive power scores dropped to 59% for the commission score and 63% for

the correct response and omission scores. These results indicate that abnormal scores can rule in a diagnosis of ADD in 9 of 10 cases, but normal scores do not rule out ADD. Abnormal, scores do not, however, differentiate subtypes.

Sensitivity of the Porteus Mazes and the Rey-Osterrieth Test were unacceptably low (Barkley & Grodzinsky, 1994). The Stroop test had moderate sensitivity, but was also sensitive to LD subjects. This caused the positive predictive power to be low. The Trail Making Test had moderate sensitivity for the two types of ADD. But even when the types were combined the positive predictive power rose to only 75% with an negative predictive power of 53%. This means that 25% of abnormal scores were false positives and there was a false negative rate of 47%. The Wisconsin Card Sorting Test had low to modest sensitivity rates for the both types of ADD. The positive predictive power rose when the subtypes of ADD were combined to 75% on the perseverative errors score which had the highest positive predictive power. The negative predictive power for this score was 55%. This still yields 25% false positive rate and a false negative rate of 45%. On the COWAT, the F-A-S scores proved useful. The positive predictive power was low like in the previous tests when the ADD subtypes were considered separately. When the ADD subtypes were combined, the positive predictive power rose to 90% with an negative predictive power of 59%. This yields 10% false positives and 41% false negatives. Therefore, like the CPT, abnormal scores can be useful in ruling in a diagnosis of ADD, but normal scores should not be interpreted. The Hand Movements test had low sensitivity. The Grooved Pegboard Test had moderate sensitivity to both ADD types, but unfortunately, was also sensitive to LD and controls.

From the study, it appears that both the CPT and the F-A-S scores on the COWAT proved useful in making a diagnosis of ADD (Barkley & Grodzinsky, 1994). They both appeared useful in ruling in a diagnosis if abnormal scores were obtained, however, neither was useful in ruling out a diagnosis when normal scores were obtained. In this light, normal scores on these tests should not be interpreted when considering a diagnosis of ADD. Additionally, it must be remembered that subjects were compared to normal subjects rather than clinical controls. Other clinical conditions may affect performance of the CPT or the COWAT. Therefore, abnormal scores can help to rule in a diagnosis of ADD only after other conditions that could affect performance have been ruled out.

The practice of using controls screened for psychiatric diagnosis rather than clinical controls might unfairly inflate positive predictive power. Further research needs to be done using clinical controls to examine whether positive predictive power remains high. Also, it must be remembered that teacher ratings of the subjects were used in most studies to define the subject groups. The tests were evaluated by their ability to correspond to teacher ratings of the subjects behavior.

Clinical Assessment in Adults. Only a handful of studies using neuropsychological assessment of adults with ADHD could be found. Gualtieri, Ondrusek, and Finley (1985) used 22 subjects who met diagnostic criteria for ADD-Residual Type in the DSM-III (APA, 1980). A portion of these subjects came from clinical referrals from other psychiatrists. They reported that the subjects had childhood histories of ADD with Hyperactivity and continued to have difficulty with poor attention span and distractibility, restlessness and fidgety behavior, impulsiveness, emotional lability, unsatisfactory level of

efficiency at work, and difficult interpersonal relationships. The authors gave a list of procedures and tests used in making a diagnosis; however, they did not report what criteria were used to include subjects in the study. In addition, they reported that the subjects had histories that were consistent with ADD with Hyperactivity according to DSM-III (APA, 1980), but it was not stated as to whether the subjects met the full criteria as a child or simply had some of the same symptoms.

Portions of the twenty-two subjects were used in a comparison study, a methelphenidate blood study, and a brainstem evoked response study (Gualtieri et al., 1985). The comparison study used 12 ADD subjects and 12 controls who were screened for medical, neurologic, psychiatric, and developmental problems.

The ADD subjects had significantly higher self-ratings of depression and anxiety according to the Zung Self-Rating Scales of Depression and Anxiety, poorer scores on a CPT, and higher amounts of fidgeting behavior (Gualtieri et al., 1985). Significant differences were also discovered in physical exams for neurological soft signs and minor physical anomalies. The families of the ADD subjects had significantly greater histories of ADD, but differences in psychiatric disorders, legal problems, and alcoholism were elevated but did not reach significance. Scores on the Minnesota Multiphasic Personality Inventory (MMPI) as a whole were significantly more elevated on the ADD subjects than on the controls. The K and L scales were significantly lower in the ADD group, while the F scale was higher. In the males, the clinical scales Pt, Sc, Ma, and Si, were significantly more elevated, while in the females the only significantly different scale was Hy. It is important to note that the control group was screened for current and past psychiatric problems while the ADD group was not. In

addition, eight of the twenty-two ADD subjects were referred by psychiatrists. The inclusion of subjects referred by psychiatrists may be a confounding factor since psychiatric problems other than those symptoms associated with ADD could be effecting the results. It appears that the ADD group was partly a patient population and it was compared to a population where subjects with psychiatric diagnoses were excluded. Subjects with comorbid psychiatric conditions needed to be excluded from the ADD group to be certain that the differences found were due to ADD.

In this light, the results are not surprising in that the ADD group came out more impaired on a number of measures (Gualtieri et al., 1985). The ADD group appeared to show more global impairment, including impairment on attention measures as well as elevated scores on depression and anxiety scales. Encouraging from this study was that the ADD subjects showed impairment on the attention tasks; however, it is not clear if significant differences in means could translate into cutoff scores that would be useful in diagnosis. Another significant part of this study was the use of observational data. Subjects and controls were compared on their fidgeting behavior while taking the tests. This was the only adult study found using observational data.

In the methylphenidate study, there were no significant differences in serum levels or blood pressures or heart rate at 1 hour following administration (Gualtieri et al., 1985). Blood pressure and heart rate were noted to be higher in the ADD group. The ADD subjects significantly improved correct responses on the CPT. Also, declines in commission errors and fidgeting behavior were noted, but did not reach significance levels. In this study, the Brainstem Evoked Response to the methyphenidate was measured and seven waves were

identified: 1. eighth nerve; 2. auditory nucleus; 3. superior olivary complex; 4. nucleus of the lateral lemniscus; 5. inferior colliculus; 6. geniculate body; 7. auditory projections to the cortex within the thalamus. Baseline Brainstem Evoked Response did not differ between the groups.

The authors concluded that these studies do not present compelling evidence to support ADD-Residual Type as a "distinct diagnostic entity" with "clear therapeutic implications" (Gualtieri et al., 1985, p. 355). Indeed, these studies did not. The authors also asserted that the concept of ADD was nebulous and poorly defined and at best represented a cluster of tempermental traits and cognitive weaknesses. Unfortunately, the syndrome of ADHD is currently characterized by a cluster of behavioral symptoms and nothing more.

These studies had a few methodologic problems. The most obvious problem was the small sample sizes used (Gualtieri et al., 1985). With such small sample sizes obtaining statistical significance would be quite difficult, and therefore, conclusions can not be drawn from failing to find significant results in certain measures. Another problem was that the ADD group was partly obtained through referrals from psychiatrists and psychiatric problems other than ADD were not screened out. Psychiatric problems were screened out for the control group. The results, therefore, were confounded by the possible existence of other clinical conditions. Depression, anxiety, and substance abuse, problems could have altered the scores of the ADD group and were not necessarily the result of ADD. Co-Morbid conditions needed to be screened out in order to yield results that were due to the symptoms of ADD and not these other conditions.

Another series of studies operationally defined attention dysfunction as the bottom 5% of scores on an adaptive rate CPT (Buchsbaum & Sostek, 1980; Buchsbaum et al., 1985; Huhtaniemi, Haier, Fedio, & Buchsbaum, 1983). These researchers then compared the performance of the poor attention group to the upper 5% on the CPT. They gave 400 college students the CPT and then selected the upper and lower 5%. Buchsbaum et al. (1985) repeated the procedure in Buchsbaum and Sostek (1980). Huhtaniemi et al. (1983) used the original subjects from Buchsbaum and Sostek (1980) and gave them additional tests.

Buchsbaum and Sostek (1980) looked at an adaptive rate CPT's reliability and ability to assess vigilance. The reliability coefficients on the first portion of the test between initial screening and follow-up of an attention score, a response bias score, and the interstimulus interval were .58, .39, and .74, respectively. The attention score was derived using the total correct and the total possible. This is comparable to omission errors reported by Barkley et al. (1990). The response bias score was derived from the number of false alarms and the total signals, which is comparable to the commission score used by others (Buchsbaum and Sostek, 1980). The reliability coefficients between the first block and the second block for the attention score, the response bias score, and the interstimulus interval were .42, .59, and .85. These reliability coefficients appear low and were lower than the coefficients reported by Gorden and Mettelman (1988) on another version of the CPT. The difference in the reliability coefficients could be explained by the different types of CPT's used. Buchsbaum and Sostek (1980) used an adaptive rate CPT, where the interval between each stimulus presentation either increased or decreased depending on either a correct response or an omission respectively. The version used by Gorden and

Mettelman (1988) presented the stimulus at a constant rate. The adaptive rate CPT might cluster scores since the task became more difficult for the better performers and then was less difficult for the poorer performers. Buchsbaum and Sostek (1980) concluded further that the task was a valid measure of vigilance since the scores deceased over time, and this finding was greater in the poor performing group than in the good performing group. However, the performance over time was also affected by the variable stimulus interval. If the subjects got more correct than they omitted, the test got progressively more difficult. The increasing difficulty of the test would better account for the declining scores than a decreasing ability to sustain attention.

Huhtaniemi et al. (1983) located a portion of the Buchsbaum and Sostek's (1980) subjects and gave them an additional battery of tests. They compared the poor attention group to the good attention group , as defined by the adaptive rate CPT, on a series of neuropsychological measures. Subjects were given the Canter Background Interference Procedure of the Bender Gestalt test, the Tangled Lines Test, Thurstone Word Fluency Test, the Purdue Pegboard Test, the Stylus Maze Test, the Gorham Proverbs Test, the Rey-Osterrieth Complex Figure Test, the Willner Unusual Meaning Vocabulary Test, and the Wechsler Adult Intelligence Scale (WAIS). The poor attention group scored more poorly on 13 of the 14 tests, but only 7 were significant. Significant results were obtained on the Benton D score, Rey's Tangled Lines, Stylus Maze, Proverb Concreteness, and the Purdue Pegboard had three significant findings, left hand, right hand, and both hands. The WAIS also had significant findings. The Full Scale, the Verbal and the Performance IQ's were all significantly different as well as 4 of the 11 subtests. The greatest difference was found on the Digit-Symbol subtest.

Bushsbaum et al. (1985) repeated the procedure of Buchsbaum and Sostek (1980) with a new group of subjects and arrived at a good attention and a poor attention group based on scores on an adaptive rate CPT. They gave these two groups a psychiatric evaluation, the WAIS, the Stroop Test, a self-report hyperactivity scale, learning and memory tests, and a neurological examination. Also, reaction times, smooth-pursuit eye movements, evoked potentials, and platelet MAO levels were measured. On the self-report hyperactivity scale, 6 of 20 individuals in the poor attention group and one in the good attention group met the criteria. On the neurological exam, foot taping, rapid alternating movements, right-left confusion, competing actions, fixed strabismus, writing to dictation, spelling, and dysgraphis differentiated the groups.

The psychiatric exam revealed no differences in psychopathology (Bushsbaum et al., 1985). There were also no differences on the MMPI, the Eysenck Personality Inventory, or the Chapman Anhedonia Inventory. These findings differ from Gaultieri et al. (1985) who found greater scores on the MMPI in an ADHD group and a normal group. However, this study was different in that it used college students and few of them in the poor attention group met criteria for ADHD. The methodological problems in Gaultieri et al. (1985) were discussed above.

The cognitive tests also revealed significant results (Bushsbaum et al., 1985). On the WAIS, the Digit-Symbol, Picture Completion, Block Design, Object Assembly, Picture Arrangement, Vocabulary, and Arithmetic subtests all show significant differences. Also, the Full Scale, Verbal, and Performance IQ's showed significant differences between the groups. On the Stroop Test, the poor attention group had significantly slower reaction times and did significantly

worse on a serial learning task. Also, measures of evoked potentials showed lower amplitudes in the poor attention group.

The studies of Huhtaniemi et al. (1983) and Buchsbaum et al. (1985) both used an operational definition of poor attention as being the bottom 5% on a adaptive rate CPT. Also, only a minority of the subjects in this group met criteria for ADHD. The finding that these subjects differed from the upper 5% on neuropsychological tests basically shows a correlation between scores on the neuropsychological tests and scores on a adaptive rate CPT. It is not known from this data whether these neuropsychological tests would prove useful in diagnosing ADHD in adults.

Another interesting study used pathological gamblers and investigated their childhood histories of ADHD (Rugle & Melamed, 1993). The subjects were also given a battery of neuropsychological tests. They used only non-substance abusing gamblers to avoid confounding because of drug affects. They confirmed self-report measures of alcohol and drug use by interviewing collaterals. Also, the authors excluded subjects with medical conditions that might compromise neurological function and subjects with a history of Axis I diagnosis aside from gambling. They gave the subjects the childhood Self-Control Rating Scale and correlated this with reports from a collateral informant. In 95% of the subjects the informant was a first degree relative. The correlation between the subject's self-report and the informant was r=.513. This shows moderate agreement. The study only reported that the gambler's group scored significantly higher on this than the control group, it did not report how many or what percentage of the group would meet criteria for childhood ADHD.

The subjects were given two sets of neuropsychological measures (Rugle & Melamed, 1993). The first set was to measure executive aspects of attention that are thought to be controlled by the frontal cortex. These functions include maintaining coherent goal oriented activities, the ability to plan a sequence, and the ability to sustain inhibitory control over distracting stimuli. The second set was to assess lower order aspects of attention thought to be controlled by the midbrain, parietal, and temporal cortical mechanisms. These functions are believed to control alertness and the ability to focus on a stimulus. The subjects were given the Embedded Figures Test, the Wisconsin Card Sorting Test, The Porteus Maze Test, the Trail Making Test, and List Learning with Categorical Clustering to assess higher order aspects of attention. To assess lower order aspects of attention subjects were given the Symbol Digit Substitution Test, the Knox Cube Test, the Primary Memory with Interference Test, and the Seashore Rhythm Test.

None of the tests designed to measure lower order attention found differences between the groups (Rugle & Melamed, 1993). The mean scores between the gamblers and the controls were statistically different on the Wisconsin Card Sorting Test, the Embedded Figures Test, and the Porteous Maze Test.

The study mainly looked at gamblers to assess premorbid ADHD symptoms and current neuropsychological systems particularly higher order attention (Rugle & Melamed, 1993). The study is only useful for the purposes of this paper because the same tests that were used to assess the gamblers may be useful is assessment of adults with ADHD. Adults with ADHD may have

similarities to pathological gamblers including impulsivity and difficulty with higher order attention.

Klee, Garfinkel, and Beauchesne (1986) used both neuropsychological and behavior ratings of current and childhood behavior with a group of adults who had been diagnosed with ADHD as children. Subjects were chosen for the study who had received stimulant medication, psychotherapy, and remedial education. These subjects were compared to a control group who were non-clinical staff of the hospital. The ADHD group had a mean age of 20.0 and the control group had a mean age of 28.8. This age difference was significant. The two groups were matched for sex and education level. The groups were also not matched for IQ. IQ was not measured, so it is not known if the groups differed.

The subjects were given two separate behavior rating scales both based on the Conners Teacher Rating Scales (Klee et al., 1986). The first scale was a self-report measure of childhood behavior and the second was a self-report measure of current behavior. There were significant differences on 7 of the 47 items on childhood behavior. These items reflected 1) restlessness, 2) concentration problems, 3) temper outbursts, 4) impulsivity, 5) nervousness/fidgeting, 6) low boiling point, 7) a failure to finish things that are begun. There were no differences between the groups on self-reports of adult behavior.

The groups were given a CPT and subjects were scored on errors of omission, errors of commission, and a composite score (Klee et al., 1986). The subjects were also given the MFFT, and the Digit Symbol and Arithmetic subtests of the WAIS-R. Significant differences between the groups were found on the CPT omission and composite scores, and the Digit-Symbol subtest on the

WAIS-R. The ADHD group also had more commission errors on the CPT, but this score did not reach significance.

Hopkins, Perlman, Hechtman, and Weiss (1979) assessed adults who had been diagnosed as hyperactive 10-13 years earlier. The original criteria for diagnosis were: restlessness and poor concentration as the chief complaints, and these problems had to be present at both home and school. They also had to be living with at least one parent, and subjects who were psychotic, borderline psychotic, epileptic, cerebral palsied, or had IQ scores of less than 85 were excluded.

The subjects ranged in age from 17 to 24 years, with a mean age of 19.5 years (Hopkins et al., 1979). Controls were of similar age and were screened for academic and behavioral difficulties by parent and teacher reports. The subjects and controls were given the MFFT, the Embedded Figures Test, and the Stroop Color Test.

The hyperactive group did not differ in reaction time to controls on the MFFT test, but they did make significantly more errors than did controls (Hopkins et al., 1979). On the Embedded Figures Test, hyperactive subjects used significantly more time to isolate figures, correctly isolated significantly fewer figures, and made significantly more errors than controls. On the Stroop test, hyperactive subjects had a significantly longer time score and made significantly more errors.

The results from these studies using adults are encouraging, however, the subject groups could have included subjects with learning disabilities or possibly other problems that brought the scores down for reasons other than ADHD. Difficulties on neuropsychological tests have been reported with alcoholics even

months after the cessation of use (Fein et al., 1990). Also, low scores on neuropsychological tests of attention have also been reported with various types of substance abuse (Grant et al., 1978; Grant et al., 1976). In addition, as seen with childhood tests, differences in group means does not mean that a test has high positive predictive power or negative predictive power. Barkley et al. (1992) identified learning disabilities and Conduct Disorder which are often co-morbid with ADHD and which could confound many studies using neuropsychological tests. None of the above studies on adults using neuropsychological measures controlled for learning disabilities.

In critiquing these adults studies using the knowledge gained from the studies on children, it appears that none of the studies reviewed lives up to the more stringent methods used in the child studies. The neuropsychological assessment of adults for ADHD appears to be just beginning. Unfortunately, these studies do not yield clear indications for the use of neuropsychological assessment in the diagnosis of ADHD in adults. The shortcoming of these studies is the lack of studies on a adult group that met criteria for ADHD as a child and continue to have these symptoms. The other shortcoming is that the studies do not exclude subjects who may have learning disabilities or other factors that could impede their performance on neuropsychological tests. What these studies give us is direction to pursue further research. The neuropsychological tests that were correlated with childhood ADHD or with poor attention may prove helpful in differentiating adults with ADHD from controls.

Another important issue raised is from the research on children is the problem of false negatives (Barkley & Grodzinsky, 1994). Caution needs to be

used if neuropsychological tests are to be used in diagnosis. Good performance on these tests does not mean a person does not meet criteria for ADHD. For the most part, these tests were designed to detect brain damage. The shortcoming of these tests may be that the neuropsychological symptoms that are theorized to be involved in ADHD may be too subtle to be detected in these tests.

In addition, poor results on neuropsychological tests does not mean the client has ADHD. Poor scores on a neuropsychological test do not constitute the full criteria for ADHD. There are many conditions that could be behind poor performance on a test. Brain damage, learning disabilities, residual effects of alcohol or drug use, or other psychiatric conditions can cause poor results on neuropsychological tests. These other conditions need to be ruled out.

Observational Methods of Assessment. In comparison to clinical measures, observational measures have been rarely used, especially in adults. In children, Barkley et al. (1990) observed ADD+H subjects to display more off-task behaviors during a CPT than ADD-H subjects, LD subjects, and controls. During a math test, both groups of ADD subjects displayed more off-task behaviors than LD subjects, while the ADD-H completed significantly fewer problems than the ADD+H and the LD groups. In adolescents diagnosed as hyperactive, Fischer et al. (1990) found more off-task, fidgeting, vocalizing, playing with objects, and out of seat behaviors than in controls. These behaviors had been recorded while the subjects performed math problems. In the only study using observational data with adults, Gualtieri et al. (1985) found significantly higher amounts of fidgeting behavior on a CPT in the ADD group as compared to a control group. More data needs to be gathered with these methods to know whether observational data is

useful in differentiating ADHD adults from controls in terms of positive predictive power and negative predictive power.

It may be the case that the neuropsychological tests of frontal lobe function do not detect dysfunction in this population because they are generally short and given under supervision (Barkley, 1991; Fischer et al., 1990). Adults with ADHD may experience difficulty with sustained attention without external motivation to remain on task, such as sitting directly across an examiner. Observational methods of behavior may better test problems with sustaining attention and difficulty finishing tasks. A future direction of assessment of ADHD in adults may design and utilize behavioral tasks that could be video taped through a one-way mirror and later scored.

Conclusions

In this paper, various methods for arriving at a diagnosis of ADHD in adults were reviewed. It appears from this review that there is no single method that reliably and accurately diagnoses ADHD. A multimodal method of assessment is necessary including client history and the professional's diagnostic acumen.

The client's current level of functioning is an important indicator of impairment. Adults with ADHD may present with less success in educational and occupational settings, and more symptoms of Antisocial Personality Disorder than persons with similar backgrounds (Mannuzza et al., 1993; Weiss et al., 1985; Weiss et al., 1979).

A unique profile on standard testing does not exist for this disorder, therefore, other disorders that could explain impairment must be ruled out.

Checklists that attempt to assess childhood symptomatology are a useful method, but some caution needs to be used in interpreting them. There is only moderate agreement between subjects ratings of their childhood behavior and their parents ratings of their childhood behavior (DeObaldia & Parsons, 1984; Rugle & Melamed, 1993; Ward et al., 1993). When possible, both the subjects ratings and their parents ratings should be obtained. In addition, it is unknown whether these checklists can make fine distinctions between ADHD and disorders that may have similar childhood histories, such as learning disabilities, Conduct Disorder, or Oppositional Defiant Disorder.

There is some evidence to suggest that ADHD subjects under-report their childhood symptomatology (Mannuzza et al., 1993). Secondary gain could also be a motivation to inaccurately self-report, since some subjects could be looking to receive prescriptions for desired medications (Shaffer, 1994).

Clinical assessment has been investigated more in children and adolescents than in adults. In children, the CPT and the F-A-S score on the COWAT have proven useful in differentiating ADHD some subjects from controls; however, many ADHD subjects score within the normal range (Barkley & Grodzinsky, 1994). Therefore, normal scores on these tests should not be interpreted as an absence of ADHD. Observational data have also been used in assessment, but the positive and negative predictive power of these methods has not been investigated.

In conclusion, no single method appears to stand alone in making a diagnosis in ADHD in adults. Prudent assessment would include a combination of methods. First, there must be some evidence of impairment in educational or occupational functioning as required by DSM-IV (APA, 1994). Next, the

childhood history of the client needs to be reviewed for evidence that ADHD has existed since childhood. Preferably assessment of childhood behavior would be gathered from the subject and from one of the subject's parents. Other disorders that could also explain the impairments found or that could simply be co-morbid with the ADHD must be investigated by standard assessment methods. If an alternative diagnosis is made that could better explain the impairment, the diagnosis of ADHD is not made. Finally, the CPT and the F-A-S score on the COWAT have proven useful in children and may aid significantly in adult assessment. Other neuropsychological tests and observational data could be used to support a diagnosis, but at this point their statistical power has not been verified.

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